Book review

Do cats make sense?

Bridget M. Waller

Cat Sense
John Bradshaw
(Basic Books, New York, NY; 2013)
ISBN: 0465031013

For far too long, the behaviour of our pets has been seen (at best) as unconstrained by comprehensible evolutionary processes, or (at worst) entirely constructed by anthropomorphism. John Bradshaw's *Cat Sense* is a welcome attempt to challenge this status quo by demonstrating that science can help us understand why domestic cats do what they do, and how they inveigled their way into our homes. Compared to their rival, the dog, however, we know very little about our cat guests, a fact that permeates through this book loud and clear. Our understanding of the domestication of dogs has progressed rapidly in recent years [1,2], mainly due to genetic discoveries and good experimental paradigms to test their cognition. *Cat Sense*, therefore, should be seen not only as an interesting read, but also as a call to arms for scientists interested in how domestication has (and has not) shaped the cat.

The first three chapters of the book take us through the history of cat domestication, which is a trifle bewildering. Bradshaw explains that there were likely several domestication events in several locations, and there is still considerable gene flow between domestic cats and closely related wild species. Thus, it is not at all clear what happened and why. A few take-home messages. First, the author does not consider cats to be fully domesticated. Here, I guess what the author means is that domestication has not shaped cats to be as useful as other domestic animals. I don't think this comes as much of a surprise to anyone who has met a cat before, and makes sense given that cat domestication was probably a combination of active selection by humans *plus* self-domestication from the cat. In other words, cats may have been tolerated rather than welcomed. Second, humans have treated cats horribly at various stages of their history. This cruelty is probably not dissimilar to every other domestic (or other) animal, but is nevertheless unpalatable reading. Finally, the author tries to argue that women have played a greater role in the domestication of cats than men. The evidence for this is rather scant, and I suspect that the author is using western gender normative assumptions to recreate past cultures somewhat, a practice unlikely to be helpful. Ironically, the majority of concrete examples of early human–cat interaction provided by the author involve men, not women.

Chapter 4 tackles the crucial (and probably overlooked) role of learning and socialisation in cat development. In a nutshell, a cat can take one of two routes: the (almost) sociable, lovable pet, or the wild, self-sufficient destructive savage. The fact that cats can take either route so smoothly shows just how easily the cat population flits between the two worlds, again demonstrating a potentially half-hearted domestication. Bradshaw argues that the deciding factors lie within the very early stages of handling and socialisation with humans and other cats, and that more experimental investigation would be useful to determine exactly which practices create pet and which create untameable loner. Here, we start to realise that the author is worried about something, a concern that pops up throughout the book. Cats have the potential to be enriching pets, yes, but they also have the potential to be utterly dreadful pets, and unless we take measures to keep them on the good side of that fence, their future with us might be limited.

Chapter 5 speculates on how the cat perceives the world. For many, this will be where the book really begins. Importantly, the chapter starts with a strong reminder that biologists have long abandoned the idea that one animal has abilities inferior or superior to another, but instead any species is simply good at being whatever it is. The cat is extremely good at being a cat, and its senses are firmly rooted in its recent history as a predatory carnivore. The cat's experiences are less heavily based on the visual system than ours (instead more influenced by olfaction, sound, touch and balance) and probably not based in past, present and future. In fact, it is doubtful that any non-human brains are like ours in this sense, we seem to be the only species living with time. The chapter continues with interesting snippets that don't seem that surprising when pondered upon, although most cat owners probably rarely do. Cats have great night vision, but comparatively poor day and colour vision. Cats can't see well at close range, but their whiskers help compensate when tackling something close (interesting implications for the cat experience during those head butts cat owners love so much). Cats can't distinguish between subtle changes in vocal tone. We know that dogs respond to tone of voice [3] — does that mean that dogs have evolved tonal recognition in order to better understand humans? Cat paws have nerve endings in the pads and claws. Cats get stuck up trees because their claws face forward and so can't act as brakes.

Chapter 6 focuses on how cats might think and feel (cognition). Bradshaw begins by advising caution when speculating on animal mind, which is good. Human thinking and feeling *could* be very different from other animals, so it is appropriate to think parsimoniously. The author goes on to review the handful of experimental studies on cat cognition published (*e.g.* cats understand object permanence, which makes sense as they can follow prey successfully; cats don't fare too well on tool-use tasks, skills they have probably never needed). The author interprets these various studies in light of the species' current and past adaptive behaviour. He also focuses on how learning can shape the cat. He explains that cats can learn to navigate their worlds through some very basic learning processes — classical and operant conditioning. As with all animals, they can learn to respond to early indicators of good things (*e.g.* can openers) and avoid indicators of bad things (*e.g.* the smell of enemy cats). The usefulness of these principles for training is nicely emphasised, which is important, as it seems to be poorly understood by many pet owners (a status quo possibly sustained by commercial animal behaviourists claiming to use special, complicated techniques to train animals). The author emphasises that events need to occur simultaneously for a cat to learn the association — there is no point scolding a cat for some wrongdoing that occurred hours before.

In contrast to the parsimonious approach to cat learning, the author opts for a more generous account of the likely similarity between human and cat emotions. This is an area of considerable debate, and although many would applaud these questions being raised, not all scientists working in the area of comparative emotion and cognition would agree. A few more cautions would be helpful in my opinion. It is tempting to think we 'know' when a cat feels scared, angry, happy etc., but we could, of course, be wrong.

In chapter 7 the author chews over the social nature of cats and whether domestication has equipped the cat for living with other cats. The author doesn't fully flesh out why he might expect cats to become more social with other cats through domestication, but presumably sociality could have evolved as a result of more tolerant cats being favoured in human environments. The domestic cat ancestor was probably like all other felids (with the exception of lions), relatively solitary. Feral cats and wildcat hybrids, however, often live in kin-bonded cooperative groups.

Chapter 8 poses the questions which are quite possibly the most interesting, but the most difficult to answer given the current state of knowledge. How do cats manage to hold our affection so successfully? Unlike many dog breeds, cats have no obvious function (other than hunting mice, which has long since lost its utility in the majority of homes that voluntarily host cats). The author argues that cats have an evolved (through domestication) capacity to form affectionate social bonds with us, their humans. Sceptics (and those familiar with the comparatively huge affection of a dog) might question this, but the author goes on to describe various human-directed behaviours that are probably rooted in mother–kitten communication and now function to aid human–cat relations, such as purring, rubbing and meowing.

Such behaviours may indeed function as bonding mechanisms as the author suggests, but whether the cat feels actual affection is not evidenced. I also can't help feeling that we need more systematic data to test the functional significance of these behaviours (importantly, whether they result in increased human care and selection) before forming strong conclusions. One rare study

Figure 1. Do cats make sense as pets? (Photo: Anne Knowlton.)

that demonstrates this idea nicely shows that cats produce high-pitched meow sounds (of similar frequency to human infant cries) to solicit food from their human hosts, and that humans perceive these 'solicitation' purrs as particularly urgent [4]. The author suggests that cats see us as 'part mother substitute, part superior cat'. I am not convinced that we know much about this from the cat's perspective, or even why this has happened, but that we accept this role rather helplessly as they tap into our inherent perceptual biases seems highly possible.

The final chapters focus on the strained relationship between domestic cats and wildlife, and how this could affect the future of cats in our lives. The author argues that some scientific estimates of wildlife killings by cats have been exaggerated due to poor study design (at best) and anti-cat sentiment (at worst), and that better objective measures are needed to fully understand the impact of cats on wildlife. This seems plausible. The author presents some convincing arguments and quite rightly calls for more research before any serious measures are employed. However, Bradshaw also poses an amusing but rather sensible wish list for cat evolution so that the cat can co-exist with humans more happily. First, cats need to become less proficient hunters. Second, cats need to get along better

with other cats. Finally, cats need to read and understand human behaviour better (which is where dogs have really excelled). Bradshaw argues that early socialisation and training can help achieve some of these goals, but that we should also consider selective breeding of behaviour. Controversially, the author is suggesting that widespread neutering in the UK be relaxed, arguing that the practice actually selects *against* the above wish list by allowing the genes of feral cats to dominate future generations. One thing bothers me with this line of reasoning. Do we know enough about the evolution of the cat to attempt influencing its direction from this point onwards? Maybe, but I suspect other readers will also need convincing.

Cat Sense is an enjoyable read and I like that it poses as many questions as it answers. In comparison to dogs, cats are fairly useless pets and their presence in our hearts and homes seems rather odd from an evolutionary perspective. However, there is lots of work to do if we want to make firm conclusions about cat cognition and behaviour and the extent to which this has been influenced by domestication. One nagging problem with this endeavour, of course, is that scientists have made more headway answering these questions in domestic dogs precisely because working with dogs in behavioural experiments is much, much easier. Partly this is because cats are constrained by their territories and unsettled by transport to university research centres, but it could also be because cats are less rewarded by human interaction. Now, the challenge set by *Cat Sense* is for scientists to circumvent these problems and start to really understand why we let cats become such ubiquitous members of our households.

References

1. Hare, B., and Woods, V. (2013). The Genius of Dogs, (London: Oneworld Publications).
2. Kaminski, J., and Marshall-Pescini, S. (2014). The Social Dog: Behaviour and Cognition, (London: Academic Press).
3. Scheider, L., Grassmann, S., Kaminski, J., and Tomasello, M. (2011). Domestic dogs use contextual information and tone of voice when following a human pointing gesture. PLoS One *6*, e21676.
4. McComb, K., Taylor, A.M., Wilson, C., and Charlton, B.D. (2009). The cry embedded within the purr. Curr. Biol. *19*, R507–R508.

Centre for Comparative and Evolutionary Psychology, Department of Psychology, University of Portsmouth, UK.
E-mail: bridget.waller@port.ac.uk

Quick guide

Beaked whales

Peter T. Madsen[1,*], Natacha Aguilar de Soto[2], Peter L. Tyack[3], and Mark Johnson[3]

What is a beaked whale? The beaked whales (*Ziphiidae*) belong to a little known cetacean family of more than 22 species that range in size from 3 meters and a few hundred kilograms to more than 10 meters and 12 tonnes. Even though beaked whales all belong to the suborder 'toothed whales', most species, ironically, have few if any erupted teeth, and those serve as tusks in male–male interactions rather than for foraging. Despite few geographical boundaries in their deep ocean habitat, superficially similar but genetically distinct species of beaked whales share what appear to be similar foraging niches. Beaked whales routinely dive deeper than 1 km for an hour or more, and surface for such a short time that they are very difficult to sight (Figure 1). This cryptic lifestyle has, until recently, left us with very little information about some of the world's biggest predators beyond what can be gathered from stranded specimens. This second largest family of toothed whales is so little known that two new species, Perrin's beaked whale and the pygmy beaked whale, have been identified in the last 25 years, and a few more beaked whale species may be awaiting discovery. It is thought-provoking that there are possibly elephant-sized mammalian predators still roaming the world's oceans that science has not yet even named. However, after many years of being a largely overlooked zoological oddity, beaked whales have recently received substantial public attention after a series of mass-strandings caused by mid-frequency naval sonars.

Why do beaked whales dive so deep? The need to understand why beaked whales may respond so strongly to navy sonar has prompted the development of techniques to study these elusive predators of the high seas. Deployments of electronic tags have revealed the underwater behavior of bottlenose, Blainville's and Cuvier's beaked whales, showing that these species routinely dive to mesopelagic depths, where they hunt for small, deep-water squid and fish. These food resources are found so deep that beaked whales often dive to more than 1000 meter depths for around an hour (Figure 1) routinely exceeding their calculated aerobic dive limit. They therefore return to the surface with a substantial oxygen debt that is paid off in a prolonged surface time that includes a series of shallow non-foraging dives (Figure 1). Recently, a tagged Cuvier's beaked whale was recorded diving more than 3000 meters during a two-hour dive that is by far the deepest dive recorded for any air-breathing endotherm. How a mammal can hold its breath for so long and survive a hydrostatic pressure of >300 kg/cm^2 is still very much a mystery. But a consequence of this deep water food source is that beaked whales spend <20% of their time foraging, which may explain why they are often found around islands and in upwelling areas that provide stable and dense patches of food resources at depth.

How do they find and catch food in the deep sea? The task of locating, approaching and catching small, agile prey in the cold, dark abyss may seem almost impossible to us humans. Beaked whales and other toothed whales have solved that problem by emitting ultrasonic clicks and listening for returning echoes to hunt by echolocation. When the first sound recording tags were deployed on Blainville's beaked whales, we were astounded to find that not only could the tags record the emitted echolocation clicks, but also the echoes returning from prey, allowing us a unique opportunity to tap into the sensory stream of a predator hunting in the wild. Because of this, beaked whales are now among the best-studied animals that use echolocation to hunt, and they have become a very unlikely model for how toothed whales in general operate their sonars in the wild. Tagged whales emit some 3500 echolocation clicks to detect and approach about 25 prey per dive (Figure 1A).